

I claim:

1. A system for polishing wafers and determining the endpoint of certain polishing procedures, where a polishing pad is secured to a platen, and the platen and polishing pad are rotated, and a surface of a wafer is held against a polishing area of the polishing pad to effect polishing of the surface, and at least a portion of the polishing pad is not used for polishing, said system comprising:

a polishing pad having an optical window disposed on the pad, in the polishing area;

an optical sensor disposed within the optical window, said optical sensor adapted to detect an optical characteristic of the wafer surface, said optical sensor being operable to output an electrical signal corresponding to the optical characteristic of the wafer surface;

an inductive coupling system operable to inductively transfers signals from the pad during rotation to a stationary receiver, said inductive coupling system comprising a first transformer winding secured to the pad such that it rotates with the pad, and a second transformer winding within the stationary receiver, and a means to communicate the electrical signal output from the optical sensor to the first transformer winding.

2. The system of claim 1 wherein the optical sensor provides a constant current output proportional to an optical characteristic of the wafer surface, and the inductive coupling system further comprises means for converting the constant

current output of the optical sensor into a time varying electrical input to the first transformer winding.

3. The system of claim 1 further comprising:

5 a light source disposed within the polishing pad for illuminating the wafer surface to provide reflected light to the optical sensor; wherein the optical sensor provides an output corresponding to the intensity of reflected light from the wafer surface.

10 4. The system of claim 1, wherein the optical sensor is disposed off center in the polishing pad, and the first transformer winding is secured to the center of the pad, and the stationary receiver is disposed in relation to the first transformer winding such that the second transformer winding is held in operable proximity to the first transformer winding.

15 5. The system of claim 1, further comprising;

a hub disposed at the center of the polishing pad, said hub housing the first transformer winding, wherein the stationary receiver is suspended over the hub such that the second transformer winding is held in operable
20 proximity to the first transformer winding.

6. A polishing pad assembly for polishing a wafer surface and collecting and transmitting data relating to the condition of the wafer surface, said polishing pad assembly comprising:

a polishing pad;

25 means for directing light at the wafer surface, said means disposed within the polishing pad;

means for detecting light reflected from the wafer surface and creating an electrical signal corresponding to the light reflected, said means for detecting light disposed within the polishing pad;

5 means for processing the electrical signal corresponding to the light reflected and producing a time-varying electrical signal corresponding to the light reflected;

a first transformer winding adapted to receive the time-varying electrical signal output of the transmitter.

10 7. The polishing pad assembly of claim 6 further comprising;

a second transformer winding disposed in operational proximity to the first transformer winding, such that time varying electrical signal inputs into the first transformer winding are induces a time-varying electrical
15 signal in the second transformer winding for output to means for analyzing the signal to determine the condition of the wafer surface.

8. The polishing pad assembly of claim 6, wherein:

20 the means for directing light at the wafer surface comprises an LED;

the means for detecting reflected light comprises a photodiode which produces current proportional to the amount of reflected light detected;

25 the means for processing the electrical signal and producing a time-varying electrical signal comprises a signal processor adapted to produce an processed electrical signal corresponding to the current output by the photodiode and a transmitter adapted to produce a

time varying current corresponding to the processed signal;

9. The polishing pad assembly of claim 7, wherein:

the means for directing light at the wafer surface
5 comprises an LED;

the means for detecting reflected light comprises a photodiode which produces current proportional to the amount of reflected light detected;

10 the means for processing the electrical signal and producing a time-varying electrical signal comprises a signal processor adapted to produce an processed electrical signal corresponding to the current output by the photodiode and a transmitter adapted to produce a time varying current corresponding to the processed
15 signal;

10. The polishing pad assembly of claim 6 wherein the first transformer winding is located near the center of the pad, and secured to the pad such that it rotates with the pad when the pad is rotated.

20 11. The polishing pad assembly of claim 7 wherein the first transformer winding is located near the center of the pad, and secured to the pad such that it rotates with the pad when the pad is rotated, and the second transformer winding is suspended above the first transformer.

25 12. The polishing pad assembly of claim 10 wherein the means for processing the electrical signal corresponding to the light reflected and producing the time-varying electrical signal, and the first transformer winding, are disposed within a hub secured

to the center of the polishing pad, and the second transformer winding is suspended near the hub.

13. The polishing pad of claim 11 wherein the means for processing the electrical signal corresponding to the light reflected and producing the time-varying electrical signal, and the first transformer winding, are disposed within a hub secured to the center of the polishing pad, and the second transformer winding is suspended near the hub.

14. The polishing pad assembly of claim 6 further comprising a secondary power transformer winding secured to the polishing pad and a primary power transformer winding disposed near the first power transformer, and means for providing power to the means for directing light from the output of the secondary power transformer winding.

15. The polishing pad assembly of claim 7 further comprising a secondary power transformer winding secured to the polishing pad and a primary power transformer winding disposed near the first power transformer, and means for providing power to the LED from the output of the secondary power transformer winding.

16. A polishing pad assembly for polishing a wafer surface and collecting and transmitting data relating to the condition of the wafer surface, said polishing pad assembly comprising:

a polishing pad;

means for directing light at the wafer surface, said means disposed within the polishing pad;

means for detecting light reflected from the wafer surface and creating an electrical signal corresponding to the

light reflected, said means for detecting light disposed within the polishing pad;

means for processing the electrical signal corresponding to the light reflected and producing a corresponding processed signal;

a transmitter for producing a time-varying electrical signal corresponding to the processed signal;

a first transformer winding adapted to receive the time-varying electrical signal output of the transmitter.

17. The polishing pad assembly of claim 16 further comprising;

a second transformer winding disposed in operational proximity to the first transformer winding, such that time varying electrical signal inputs into the first transformer winding are induces a time-varying electrical signal in the second transformer winding for output to means for analyzing the signal to determine the condition of the wafer surface.

18. A system for polishing wafers and determining the endpoint of certain polishing procedures, where a polishing pad is secured to a platen, and the platen and polishing pad are rotated, and a surface of a wafer is held against a polishing area of the polishing pad to effect polishing of the surface, and at least a portion of the polishing pad is not used for polishing, said system comprising:

a polishing pad having an optical window disposed on the pad, in the polishing area;

an optical sensor disposed within the optical window, said optical sensor adapted to detect an optical

characteristic of the wafer surface, said optical sensor being operable to output an electrical signal corresponding to the optical characteristic of the wafer surface;

5 an optical coupling system operable to optically transfer signals from the pad during rotation to a stationary receiver, said optical coupling system comprising an LED secured to the pad such that it rotates with the pad, and a detector operable to convert the light signal output
10 from the LED into an electrical signal representative of the optical characteristic of the wafer surface, said detector housed within the stationary receiver, and a means to communicate the electrical signal output from the optical sensor to the LED.

15 19. The system of claim 18 wherein the optical sensor provides a constant current output proportional to an optical characteristic of the wafer surface, and the optical coupling system further comprises means for converting the constant current output of the optical sensor into a time varying
20 electrical input to the LED (88).

20. The system of claim 18 further comprising:

a light source disposed within the polishing pad for illuminating the wafer surface to provide reflected light to the optical sensor; wherein the optical sensor
25 provides an output corresponding to the intensity of reflected light from the wafer surface.

21. The system of claim 18, wherein the optical sensor is disposed off center in the polishing pad, and the LED is secured to the center of the pad, and the stationary receiver is

disposed in relation to the LED such that the detector is held in operable proximity to the LED.

22. The system of claim 18, further comprising;

5 a hub disposed at the center of the polishing pad, said hub housing the LED, wherein the stationary receiver is suspended over the hub such that the detector is held in operable proximity to the LED.

23. A polishing pad assembly for polishing a wafer surface and collecting and transmitting data relating to the condition of
10 the wafer surface, said polishing pad assembly comprising:

a polishing pad;

means for directing light at the wafer surface, said means disposed within the polishing pad;

15 means for detecting light reflected from the wafer surface and creating an electrical signal corresponding to the light reflected, said means for detecting light disposed within the polishing pad;

means for processing the electrical signal (54, 58) corresponding to the light reflected and producing a
20 time-varying electrical signal corresponding to the light reflected;

an LED adapted to receive the time-varying electrical signal output of the transmitter and produce a corresponding light output.

24. The polishing pad assembly of claim 23 further comprising;

a photodetector disposed in operational proximity to the LED, such that time varying electrical signal inputs into the LED produce a time-varying optical signal to the photodetector which in turn produces a time varying electrical signal for output to means for analyzing the signal to determine the condition of the wafer surface.

25. The polishing pad assembly of claim 23, wherein:

the means for directing light at the wafer surface comprises an LED (28);

the means for detecting reflected light comprises a photodiode which produces current proportional to the amount of reflected light detected;

the means for processing the electrical signal and producing a time-varying electrical signal comprises a signal processor adapted to produce an processed electrical signal corresponding to the current output by the photodiode and a transmitter adapted to produce a time varying current corresponding to the processed signal.

26. The polishing pad assembly of claim 24, wherein:

the means for directing light at the wafer surface comprises an LED;

the means for detecting reflected light comprises a photodiode which produces current proportional to the amount of reflected light detected;

the means for processing the electrical signal and producing a time-varying electrical signal comprises a signal processor adapted to produce an processed electrical signal corresponding to the current output by the photodiode and a transmitter adapted to produce a time varying current corresponding to the processed signal.

27. The polishing pad assembly of claim 23 wherein the LED is located near the center of the pad, and secured to the pad such that it rotates with the pad when the pad is rotated.

28. The polishing pad assembly of claim 24 wherein the LED is located near the center of the pad, and secured to the pad such that it rotates with the pad when the pad is rotated, and the photodiode is suspended above the LED (88).

29. The polishing pad assembly of claim 27 wherein the means for processing the electrical signal corresponding to the light reflected and producing the time-varying electrical signal, and the LED, are disposed within a hub secured to the center of the polishing pad, and the photodiode is suspended near the hub.

30. The polishing pad assembly of claim 28 wherein the means for processing the electrical signal corresponding to the light reflected and producing the time-varying electrical signal, and the LED, are disposed within a hub secured to the center of the polishing pad, and the photodiode is suspended near the hub.

31. The polishing pad assembly of claim 23 further comprising a secondary power transformer winding secured to the polishing pad and a primary power transformer winding disposed near the first power transformer, and means for providing power to the means

for directing light from the output of the secondary power transformer winding.

32. The polishing pad assembly of claim 24 further comprising a secondary power transformer winding secured to the polishing pad and a primary power transformer winding disposed near the first power transformer, and means for providing power to the LED from the output of the secondary power transformer winding.

33. A polishing pad assembly for polishing a wafer surface and collecting and transmitting data relating to the condition of the wafer surface, said polishing pad assembly comprising:

a polishing pad;

means for directing light at the wafer surface, said means disposed within the polishing pad;

means for detecting light reflected from the wafer surface and creating an electrical signal corresponding to the light reflected, said means for detecting light disposed within the polishing pad;

means for processing the electrical signal corresponding to the light reflected and producing a corresponding processed signal;

a transmitter for producing a time-varying electrical signal corresponding to the processed signal;

an LED adapted to receive the time-varying electrical signal output of the transmitter and produce a time varying optical signal.

34. The polishing pad assembly of claim 34 further comprising;

a photodiode disposed in operational proximity to the LED,
such that time varying optical signal output by the LED
are detected by the photodiode, which in turn produces a
time-varying electrical signal for output to means for
analyzing the signal to determine the condition of the
wafer surface.

5